FIG.1A

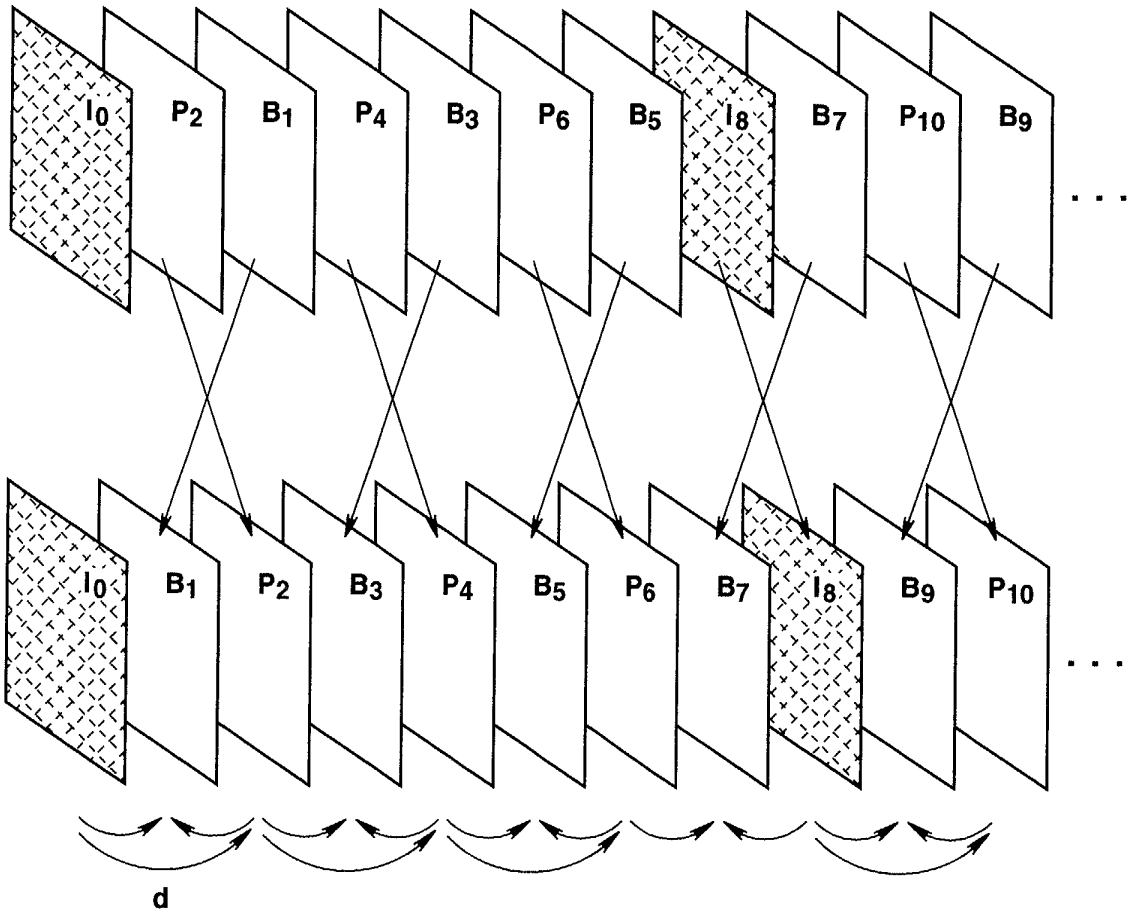


FIG.1B

SN 09/11 986 US

Patent Pending

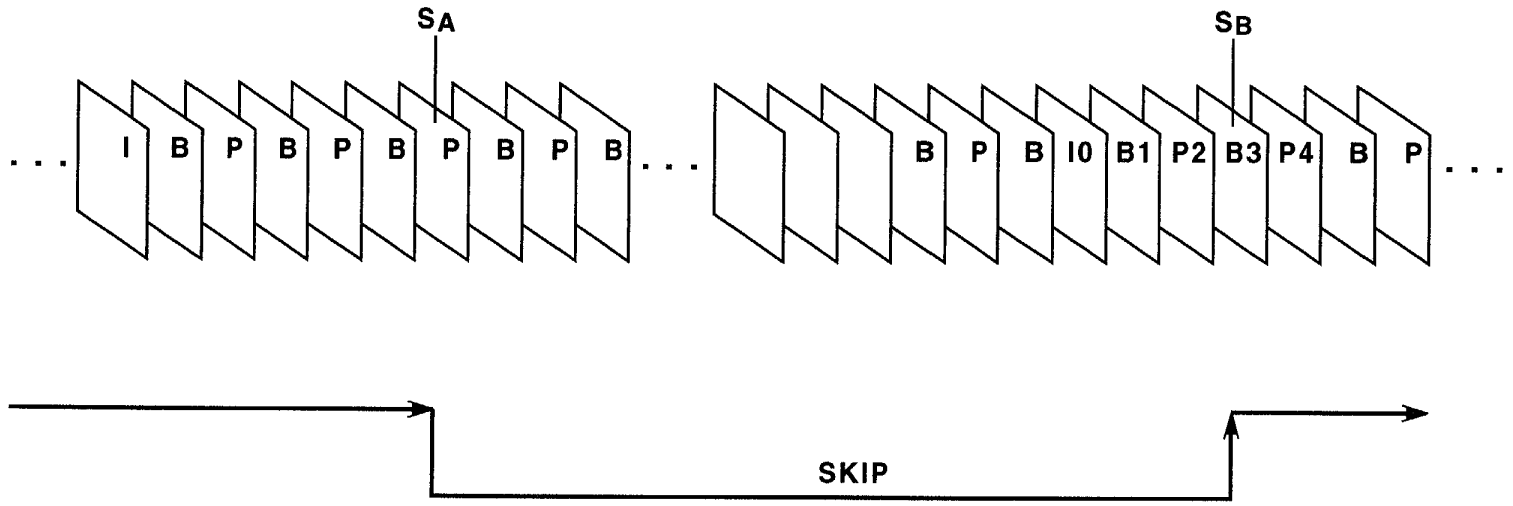


FIG.2

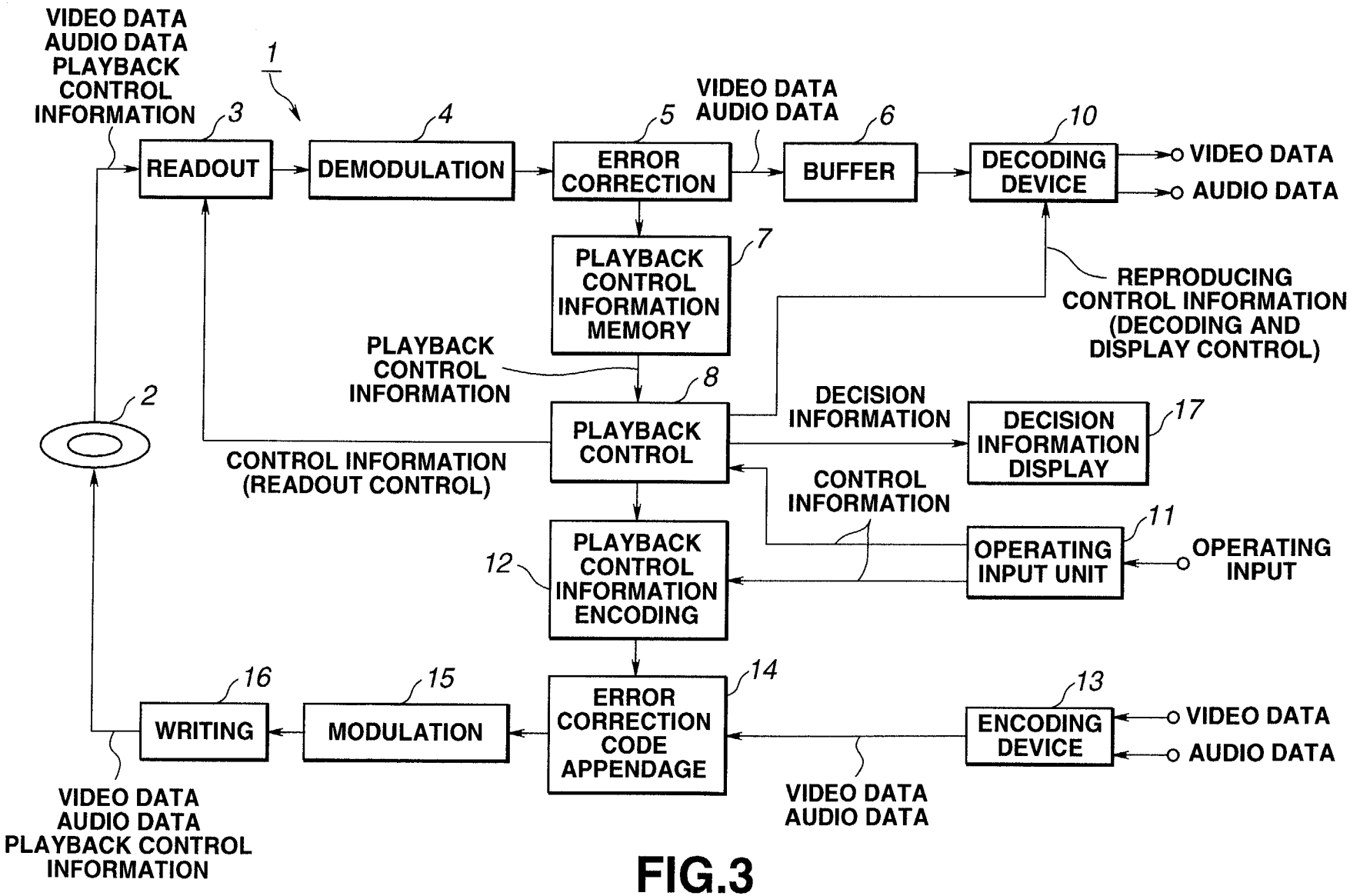

VIDEO DATA
AUDIO DATA
PLAYBACK
CONTROL
INFORMATION
1
3
READOUT
4
DEMODULATION
5
ERROR
CORRECTION
VIDEO DATA
AUDIO DATA
6
BUFFER
10
DECODING
DEVICE
VIDEO DATA
AUDIO DATA
7
PLAYBACK
CONTROL
INFORMATION
MEMORY
REPRODUCING
CONTROL INFORMATION
(DECODING AND
DISPLAY CONTROL)
PLAYBACK
CONTROL
INFORMATION
8
2
PLAYBACK
CONTROL
DECISION
INFORMATION
DECISION
INFORMATION
DISPLAY
17
CONTROL INFORMATION
(READOUT CONTROL)
CONTROL
INFORMATION
11
OPERATING
INPUT UNIT
OPERATING
INPUT
12
PLAYBACK
CONTROL
INFORMATION
ENCODING
16
15
14
13
WRITING
MODULATION
ERROR
CORRECTION
CODE
APPENDAGE
ENCODING
DEVICE
VIDEO DATA
AUDIO DATA
VIDEO DATA
AUDIO DATA
PLAYBACK CONTROL
INFORMATION
VIDEO DATA
AUDIO DATA

FIG.3

PRELIMINARY

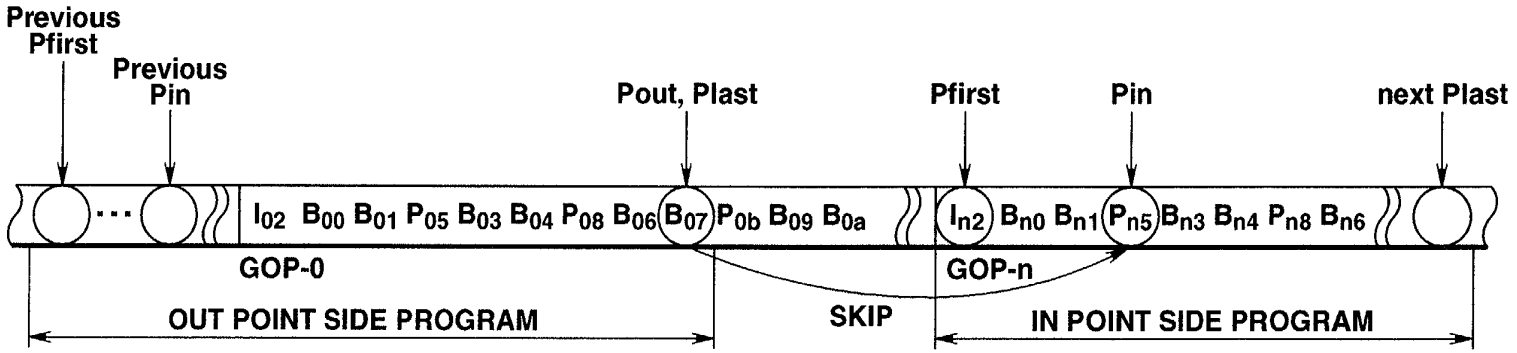
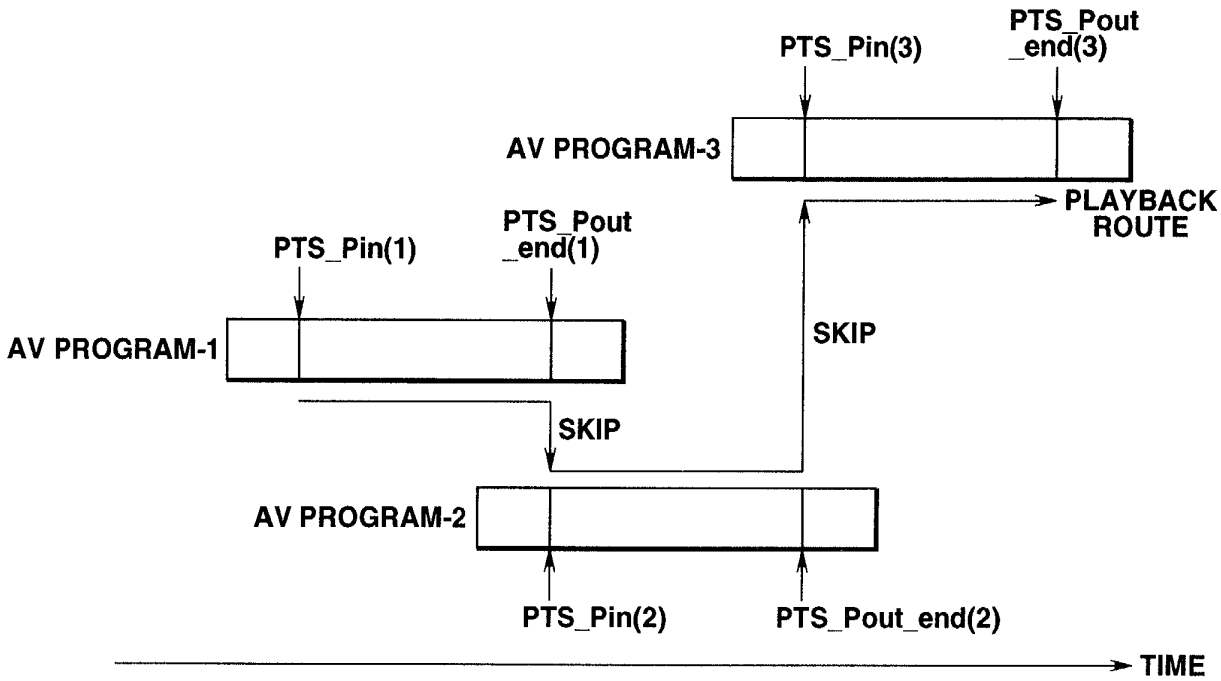


FIG.4

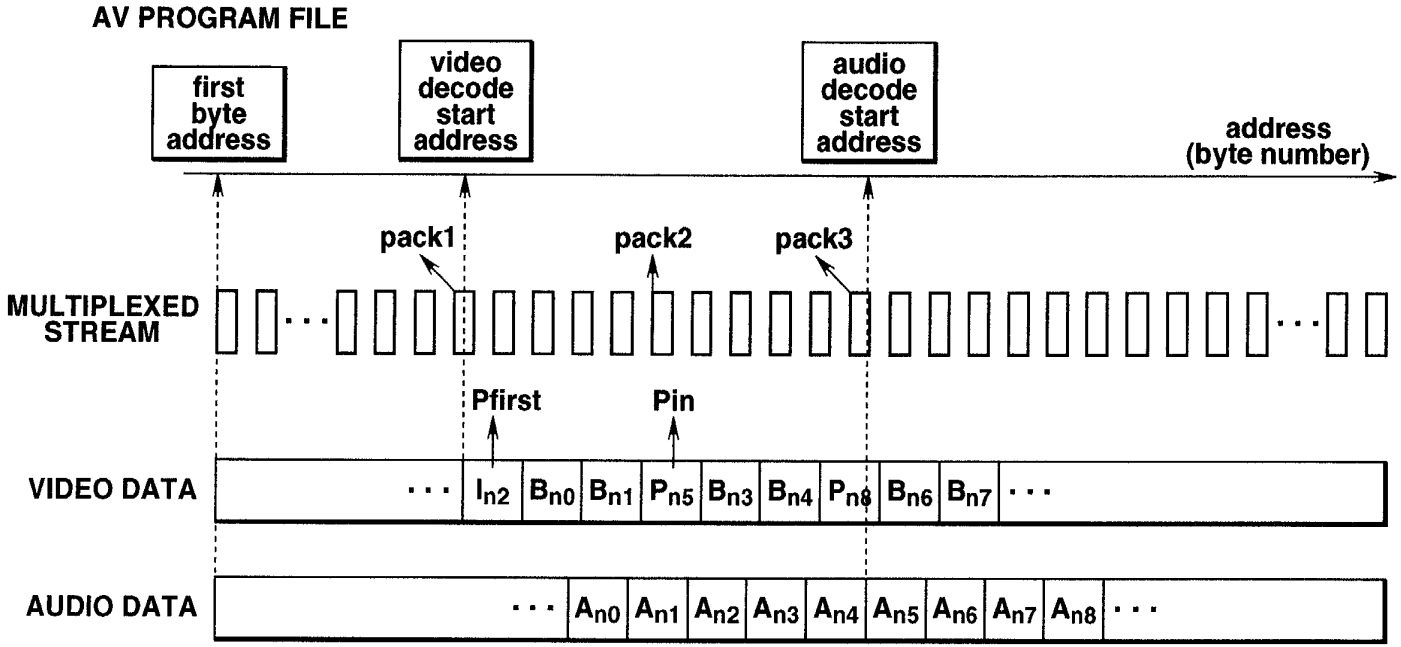


PTS_Pin(2) = PTS_Pout_end(1) − STC_offset(1)
STC_offset(1) = PTS_Pout_end(1) − PTS_Pin(2)

PTS_Pin(3) = PTS_Pout_end(3) − STC_offset(2)
STC_offset(2) = PTS_Pout_end(2) − PTS_Pin(3)

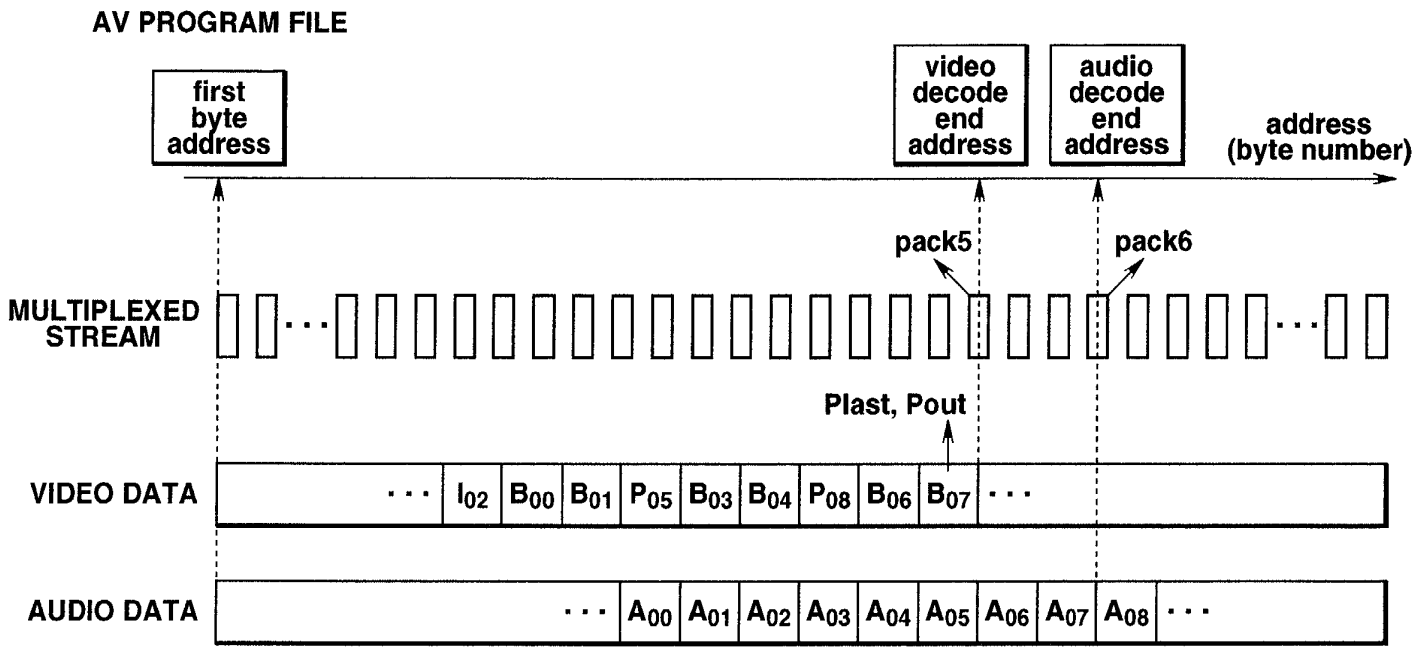
FIG.5

Patent Pending



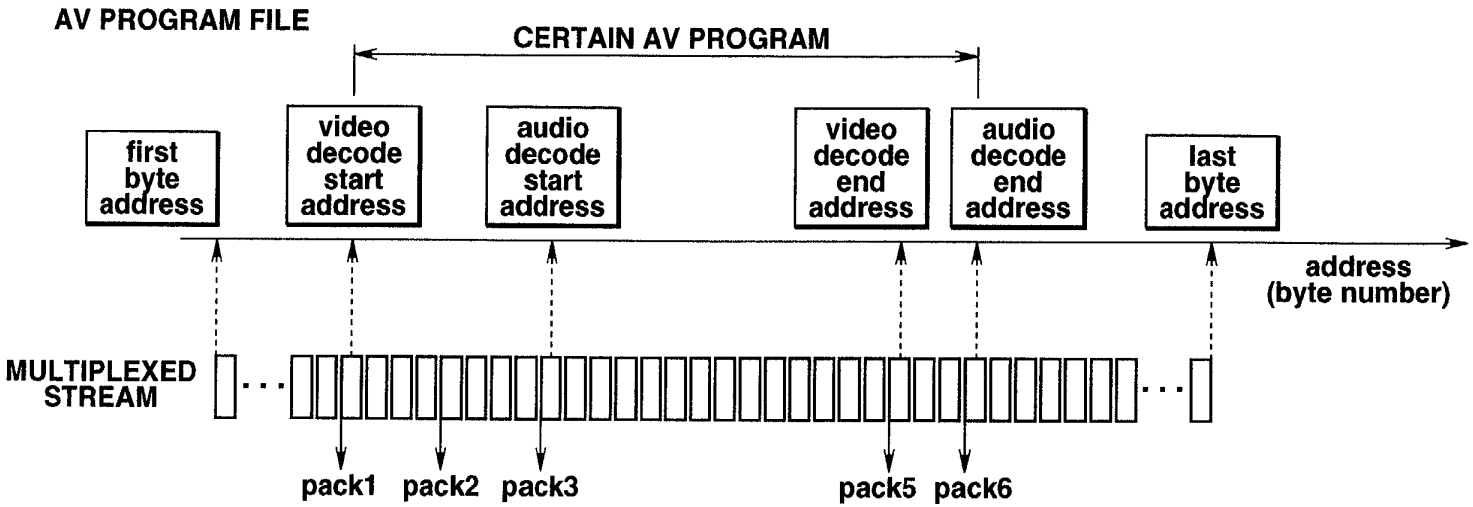
pack1 ··· FIRST PACK IN WHICH DATA OF PICTURE Pfirst IS CONTAINED
pack2 ··· FIRST PACK IN WHICH DATA OF PICTURE Pin IS CONTAINED
pack3 ··· PACK IN WHICH IS CONTAINED AN AUDIO SAMPLE REPRODUCED AT PICTURE Pin DISPLAY START TIME (PTS_Pin)

FIG.6



pack5 ··· LAST PACK IN WHICH IS CONTAINED DATA OF PICTURE Plast, Pout
pack6 ··· PACK IN WHICH IS CONTAINED AN AUDIO SAMPLE REPRODUCED AT PICTURE Pout DISPLAY END TIME (PTS_Pout_end)

FIG.7



pack1 ··· FIRST PACK IN WHICH DATA OF PICTURE Pfirst IS CONTAINED
pack2 ··· FIRST PACK IN WHICH DATA OF PICTURE Pin IS CONTAINED
pack3 ··· PACK IN WHICH IS CONTAINED AN AUDIO SAMPLE REPRODUCED AT PICTURE Pin DISPLAY START TIME (PTS_Pin)
pack5 ··· LAST PACK IN WHICH IS CONTAINED DATA OF PICTURE Plast
pack6 ··· PACK IN WHICH IS CONTAINED AN AUDIO SAMPLE REPRODUCED AT PICTURE Pout DISPLAY END TIME (PTS_Pout_end)

FIG.8

```
AV_program_File( ){
      do (
                  pack( )
      while(nextbits( )==pack_start_code)
}
```

```
pack( ) {
        pack_header( )
        PES_packet( )
}
```

```
PES_packet( ){
        packet_header( )
        PTS
        DTS
        packet_payload( )
}
```

FIG.9

AV program file (program stream file)

```
playback_information_file( ){
        PTS_Pin
        PTS_Pout_end
        video_decode_start_address
        audio_decode_start_address
        video_decode_end_address
        audio_decode_end_address

        Pin_index
        Pin_type
        Plast_index

        Pin_first_field_parity
        Pout_last_field_parity
}
```

FIG.10

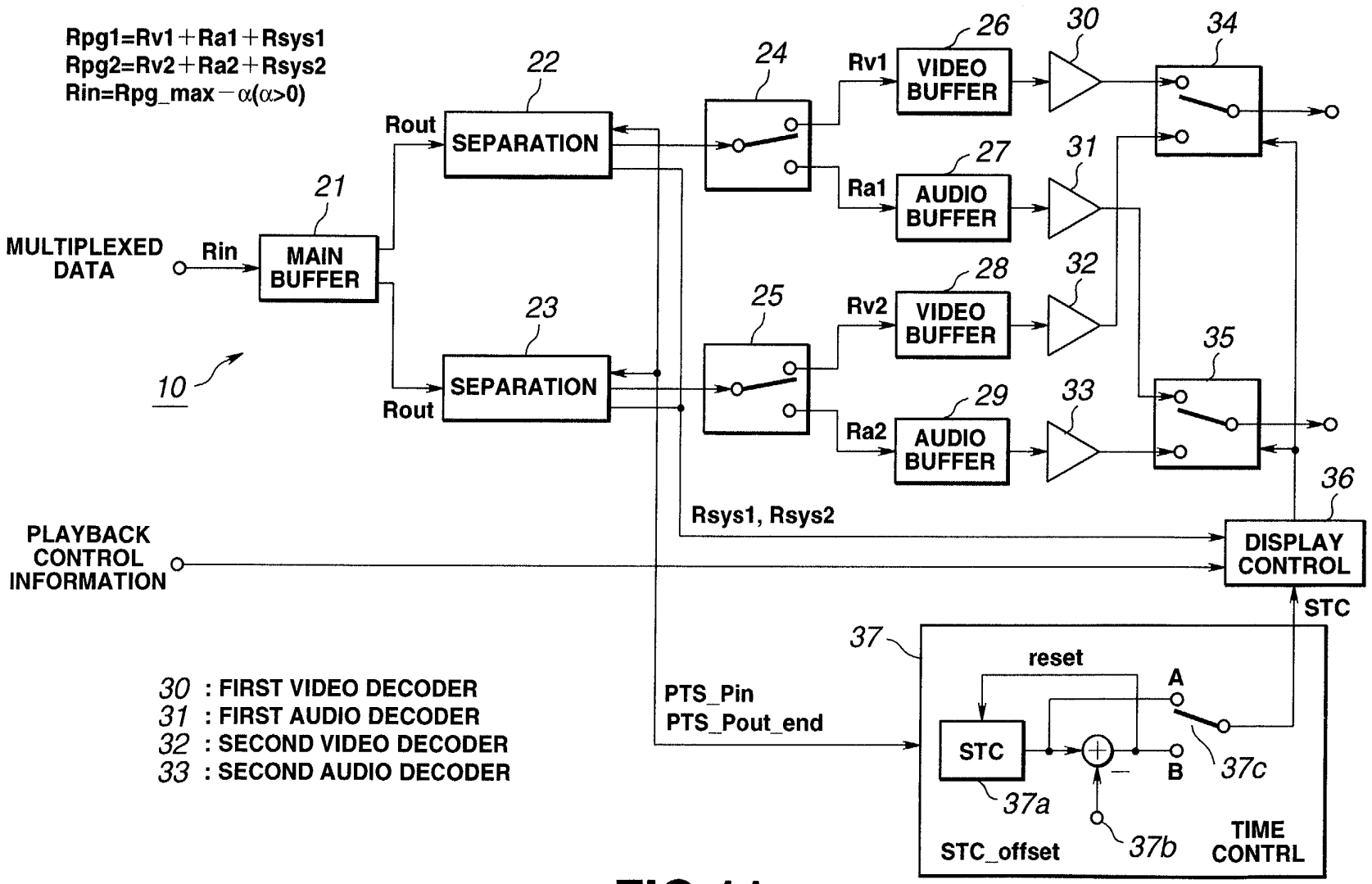

Rpg1=Rv1+Ra1+Rsys1
Rpg2=Rv2+Ra2+Rsys2
Rin=Rpg_max−α(α>0)
MULTIPLEXED DATA
Rin
21
MAIN BUFFER
22
SEPARATION
Rout
23
SEPARATION
Rout
10
24
25
Rv1
Ra1
Rv2
Ra2
26
VIDEO BUFFER
27
AUDIO BUFFER
28
VIDEO BUFFER
29
AUDIO BUFFER
30
31
32
33
34
35
36
Rsys1, Rsys2
PLAYBACK CONTROL INFORMATION
DISPLAY CONTROL
STC
37
reset
A
B
STC
37a
37b
37c
PTS_Pin
PTS_Pout_end
STC_offset
TIME CONTRL
30 : FIRST VIDEO DECODER
31 : FIRST AUDIO DECODER
32 : SECOND VIDEO DECODER
33 : SECOND AUDIO DECODER

FIG.11

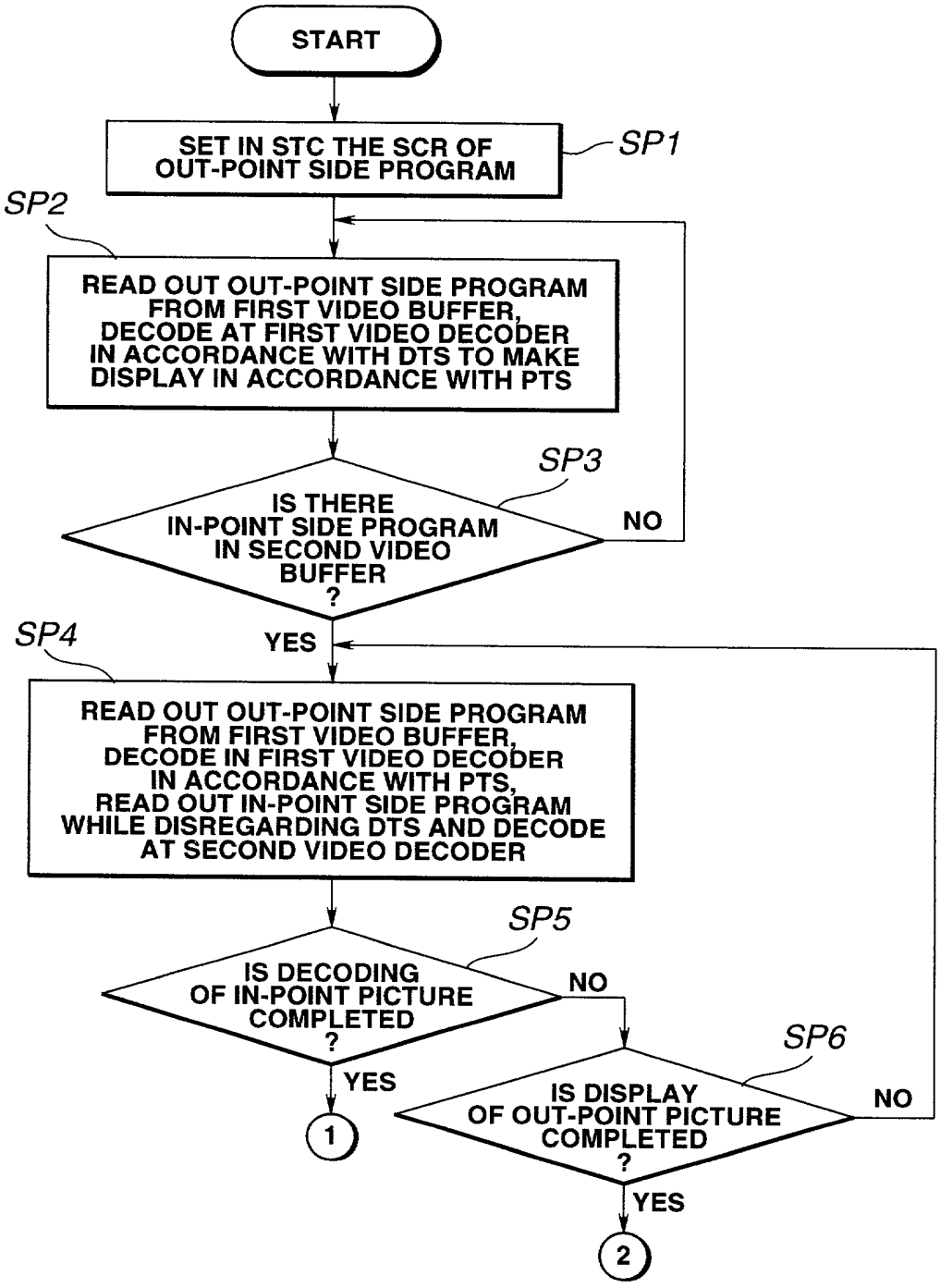

START
SET IN STC THE SCR OF OUT-POINT SIDE PROGRAM
SP1
SP2
READ OUT OUT-POINT SIDE PROGRAM FROM FIRST VIDEO BUFFER, DECODE AT FIRST VIDEO DECODER IN ACCORDANCE WITH DTS TO MAKE DISPLAY IN ACCORDANCE WITH PTS
SP3
IS THERE IN-POINT SIDE PROGRAM IN SECOND VIDEO BUFFER ?
NO
YES
SP4
READ OUT OUT-POINT SIDE PROGRAM FROM FIRST VIDEO BUFFER, DECODE IN FIRST VIDEO DECODER IN ACCORDANCE WITH PTS, READ OUT IN-POINT SIDE PROGRAM WHILE DISREGARDING DTS AND DECODE AT SECOND VIDEO DECODER
SP5
IS DECODING OF IN-POINT PICTURE COMPLETED ?
NO
YES
1
SP6
IS DISPLAY OF OUT-POINT PICTURE COMPLETED ?
NO
YES
2

FIG.12

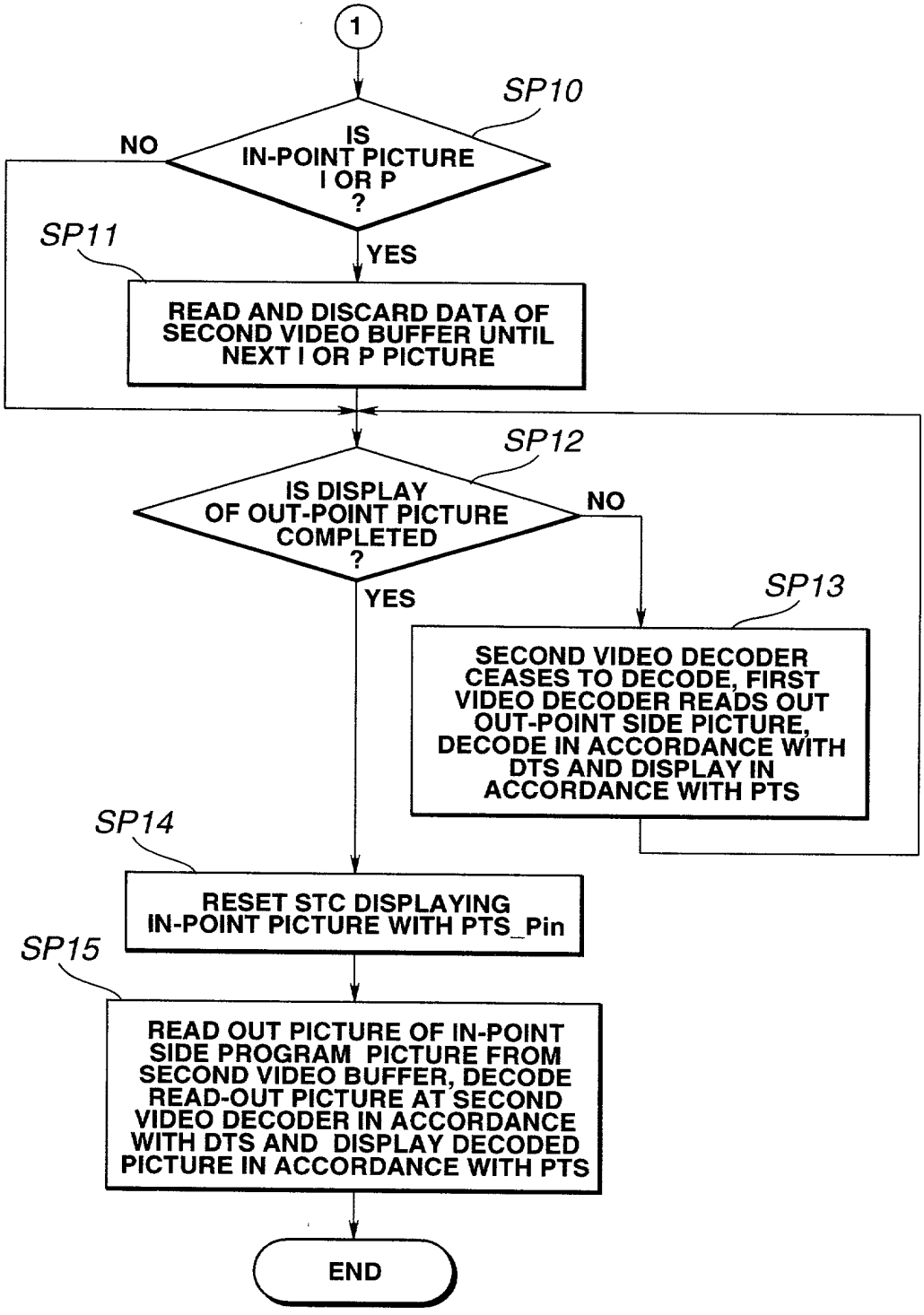

1
SP10
IS IN-POINT PICTURE I OR P ?
NO
YES
SP11
READ AND DISCARD DATA OF SECOND VIDEO BUFFER UNTIL NEXT I OR P PICTURE
SP12
IS DISPLAY OF OUT-POINT PICTURE COMPLETED ?
NO
YES
SP13
SECOND VIDEO DECODER CEASES TO DECODE, FIRST VIDEO DECODER READS OUT OUT-POINT SIDE PICTURE, DECODE IN ACCORDANCE WITH DTS AND DISPLAY IN ACCORDANCE WITH PTS
SP14
RESET STC DISPLAYING IN-POINT PICTURE WITH PTS_Pin
SP15
READ OUT PICTURE OF IN-POINT SIDE PROGRAM PICTURE FROM SECOND VIDEO BUFFER, DECODE READ-OUT PICTURE AT SECOND VIDEO DECODER IN ACCORDANCE WITH DTS AND DISPLAY DECODED PICTURE IN ACCORDANCE WITH PTS
END

FIG.13

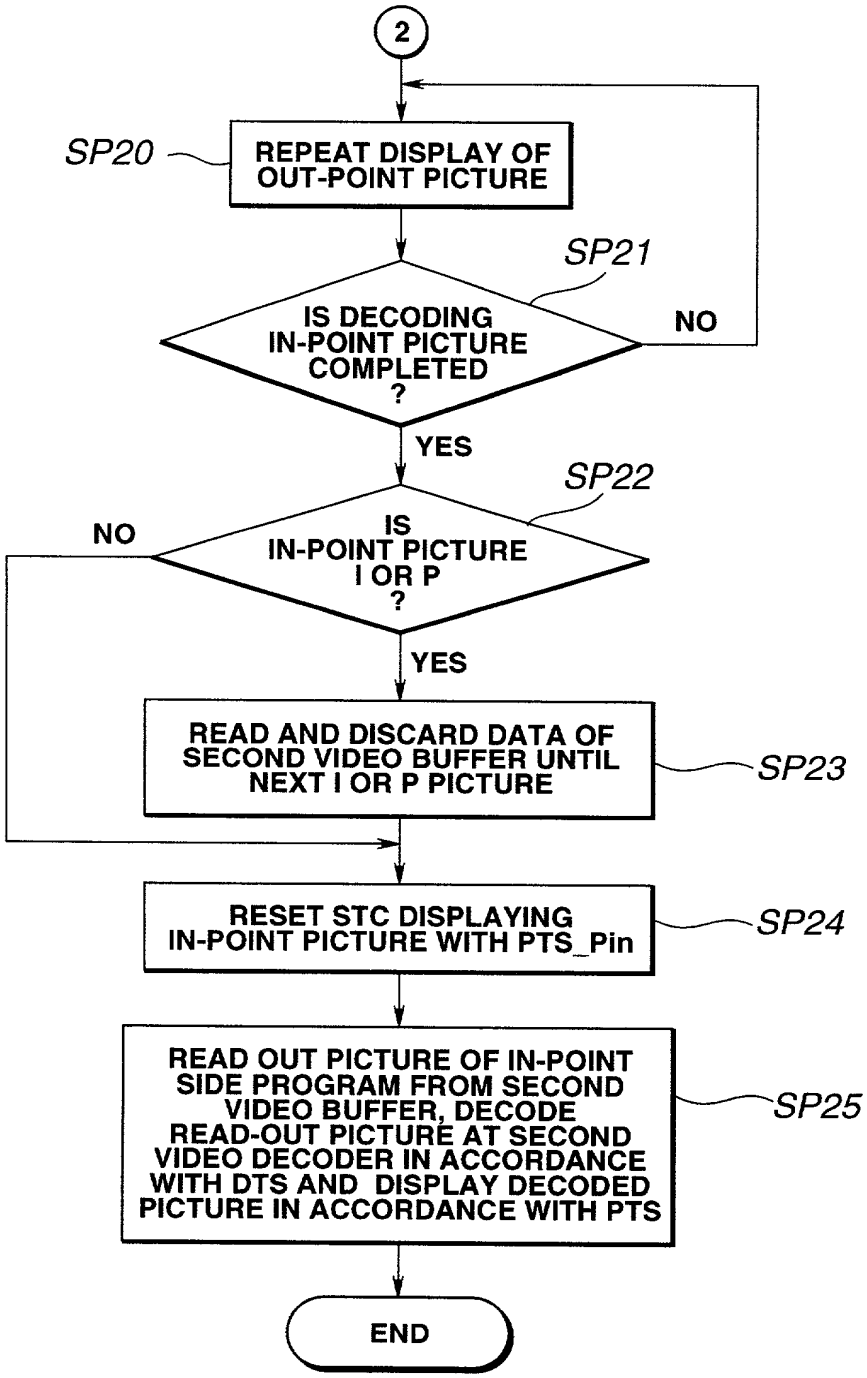

2
SP20
REPEAT DISPLAY OF OUT-POINT PICTURE
SP21
IS DECODING IN-POINT PICTURE COMPLETED ?
NO
YES
SP22
IS IN-POINT PICTURE I OR P ?
NO
YES
READ AND DISCARD DATA OF SECOND VIDEO BUFFER UNTIL NEXT I OR P PICTURE
SP23
RESET STC DISPLAYING IN-POINT PICTURE WITH PTS_Pin
SP24
READ OUT PICTURE OF IN-POINT SIDE PROGRAM FROM SECOND VIDEO BUFFER, DECODE READ-OUT PICTURE AT SECOND VIDEO DECODER IN ACCORDANCE WITH DTS AND DISPLAY DECODED PICTURE IN ACCORDANCE WITH PTS
SP25
END

FIG.14

FIG.15A

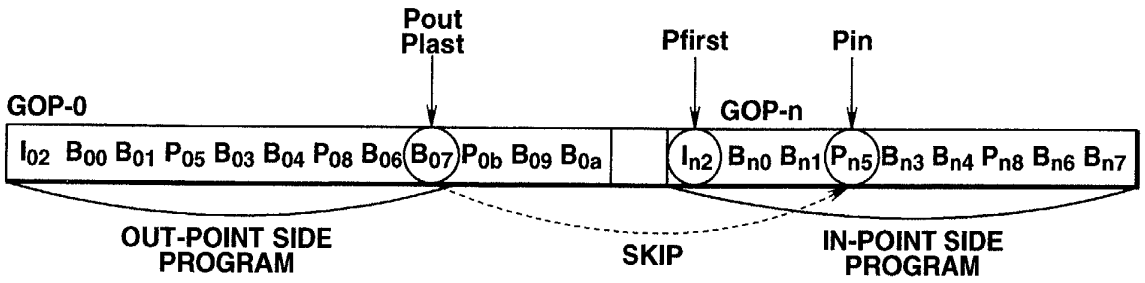


FIG.15B

FIG.15C

FIG.15D

FIG.15E

FIG.15F

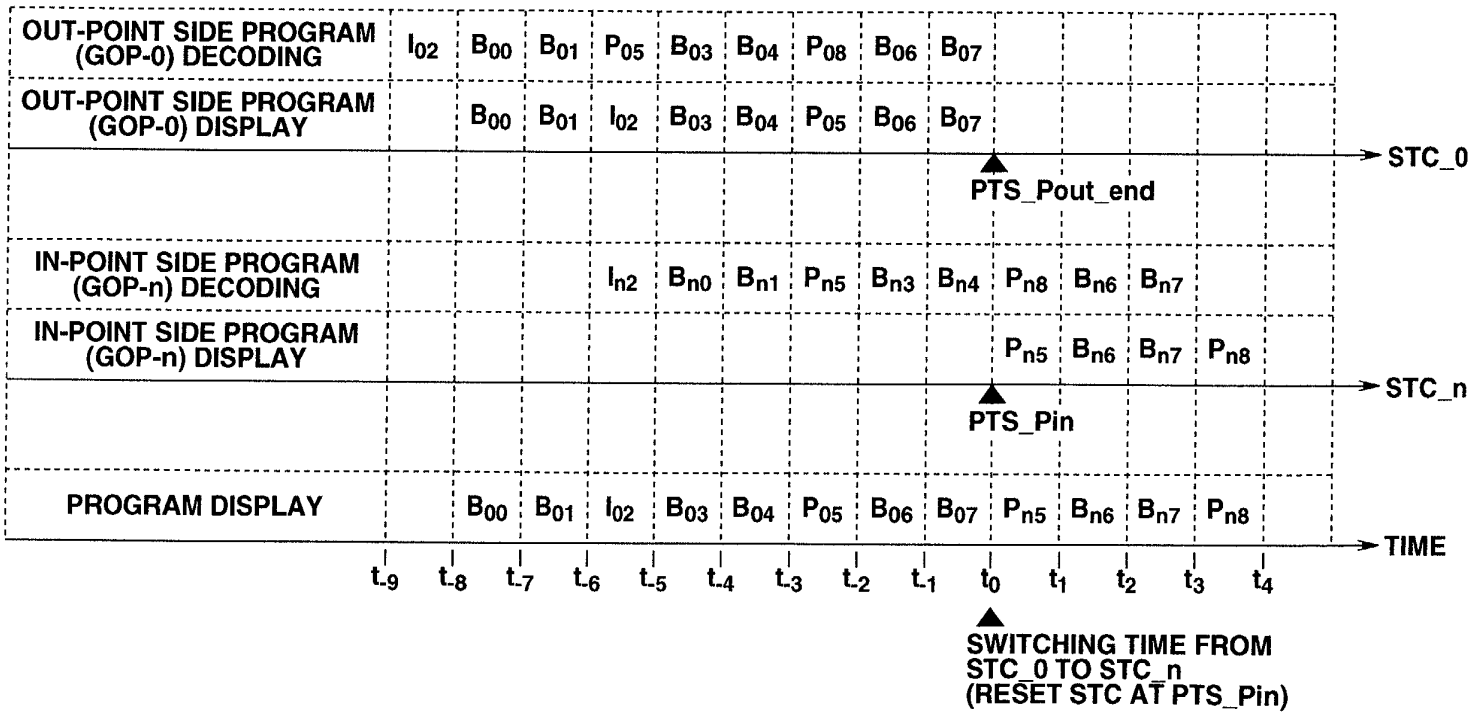
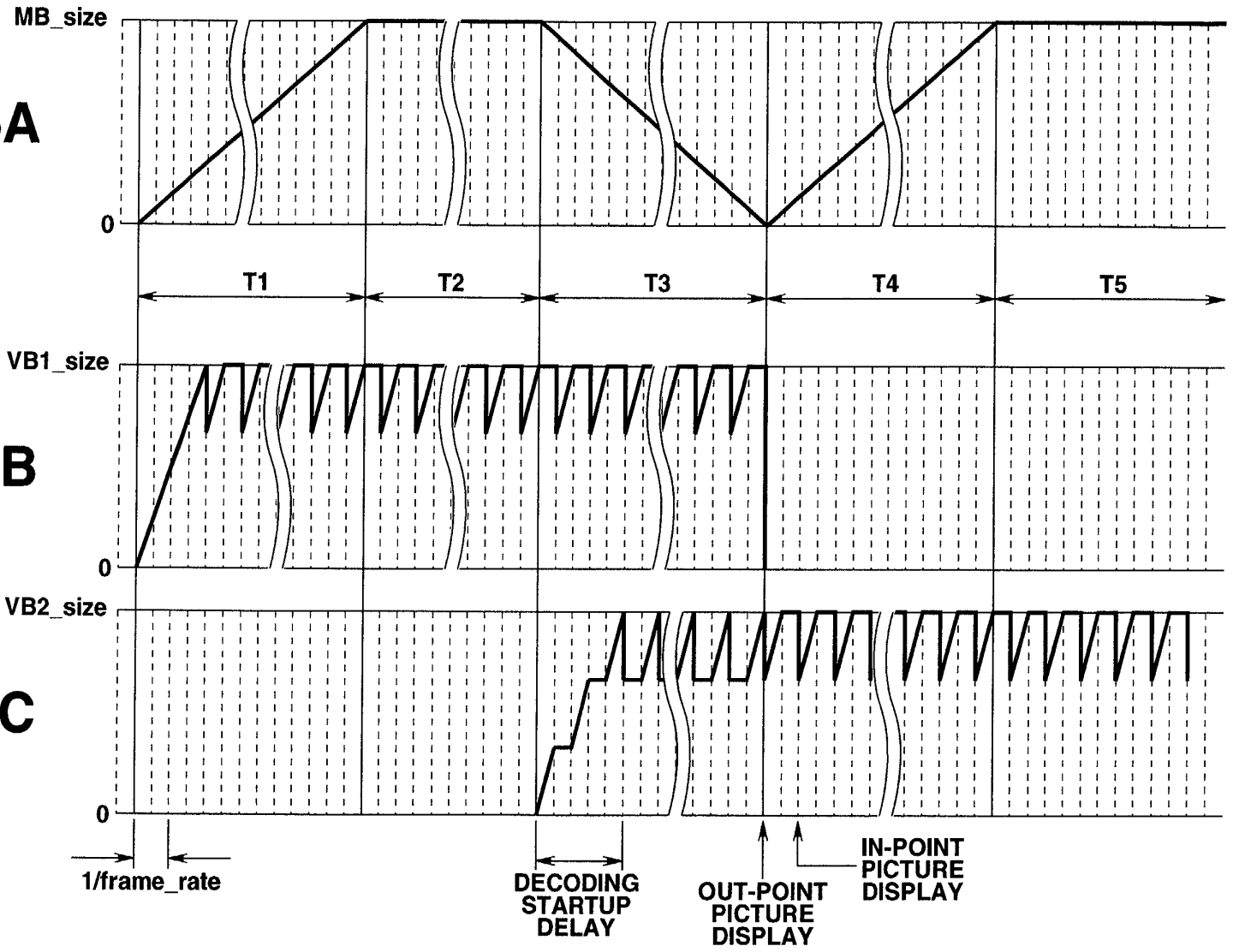


FIG.16A

FIG.16B

FIG.16C



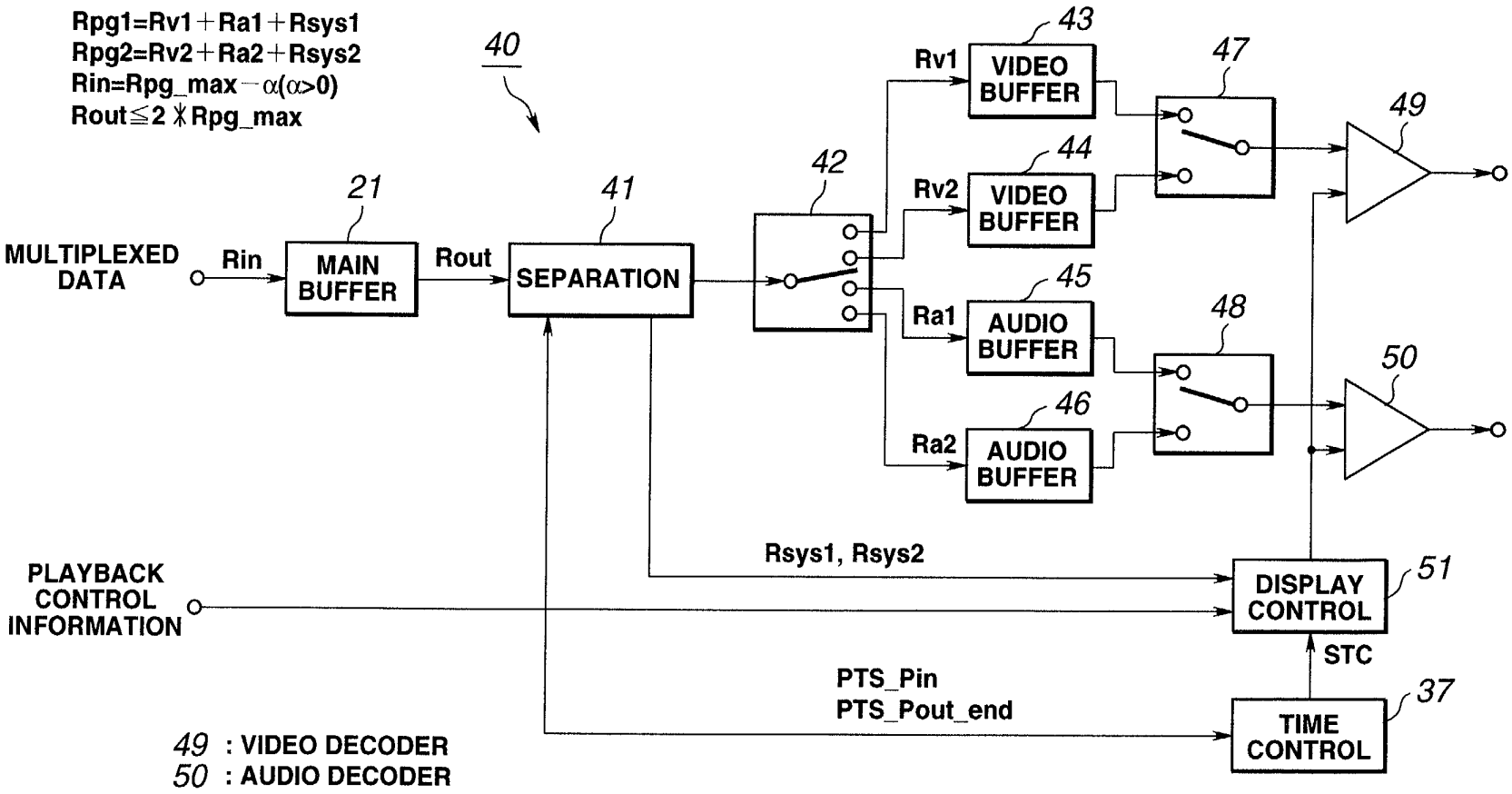

Rpg1=Rv1+Ra1+Rsys1
Rpg2=Rv2+Ra2+Rsys2
Rin=Rpg_max−α(α>0)
Rout≦2※Rpg_max
40
MULTIPLEXED DATA
Rin
21
MAIN BUFFER
Rout
41
SEPARATION
42
Rv1
43
VIDEO BUFFER
Rv2
44
VIDEO BUFFER
Ra1
45
AUDIO BUFFER
Ra2
46
AUDIO BUFFER
47
48
49
50
PLAYBACK CONTROL INFORMATION
Rsys1, Rsys2
DISPLAY CONTROL
51
STC
PTS_Pin
PTS_Pout_end
TIME CONTROL
37
49 : VIDEO DECODER
50 : AUDIO DECODER

FIG.17

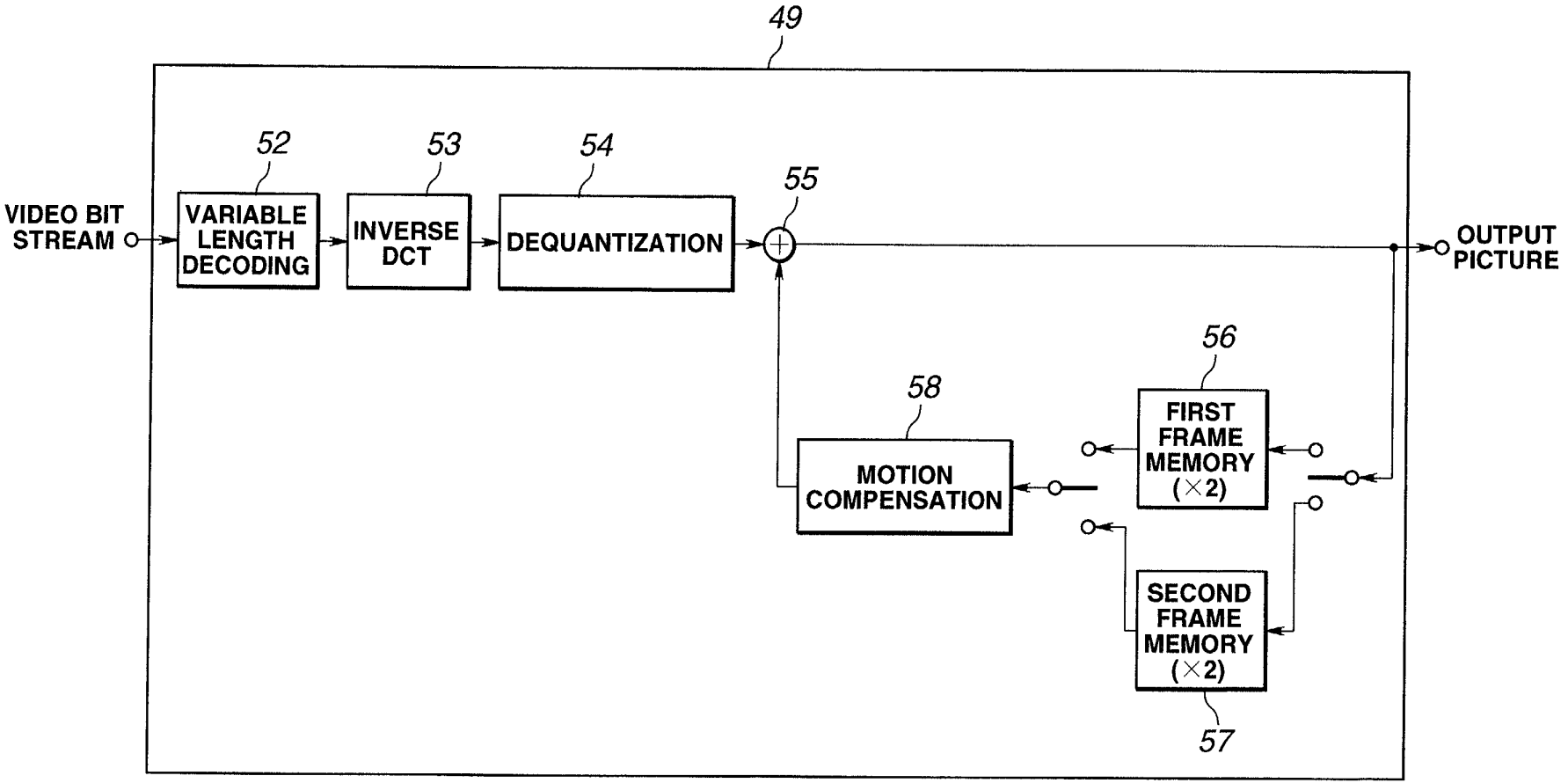

49
52
53
54
55
VIDEO BIT STREAM
VARIABLE LENGTH DECODING
INVERSE DCT
DEQUANTIZATION
OUTPUT PICTURE
56
58
FIRST FRAME MEMORY (×2)
MOTION COMPENSATION
SECOND FRAME MEMORY (×2)
57

FIG.18

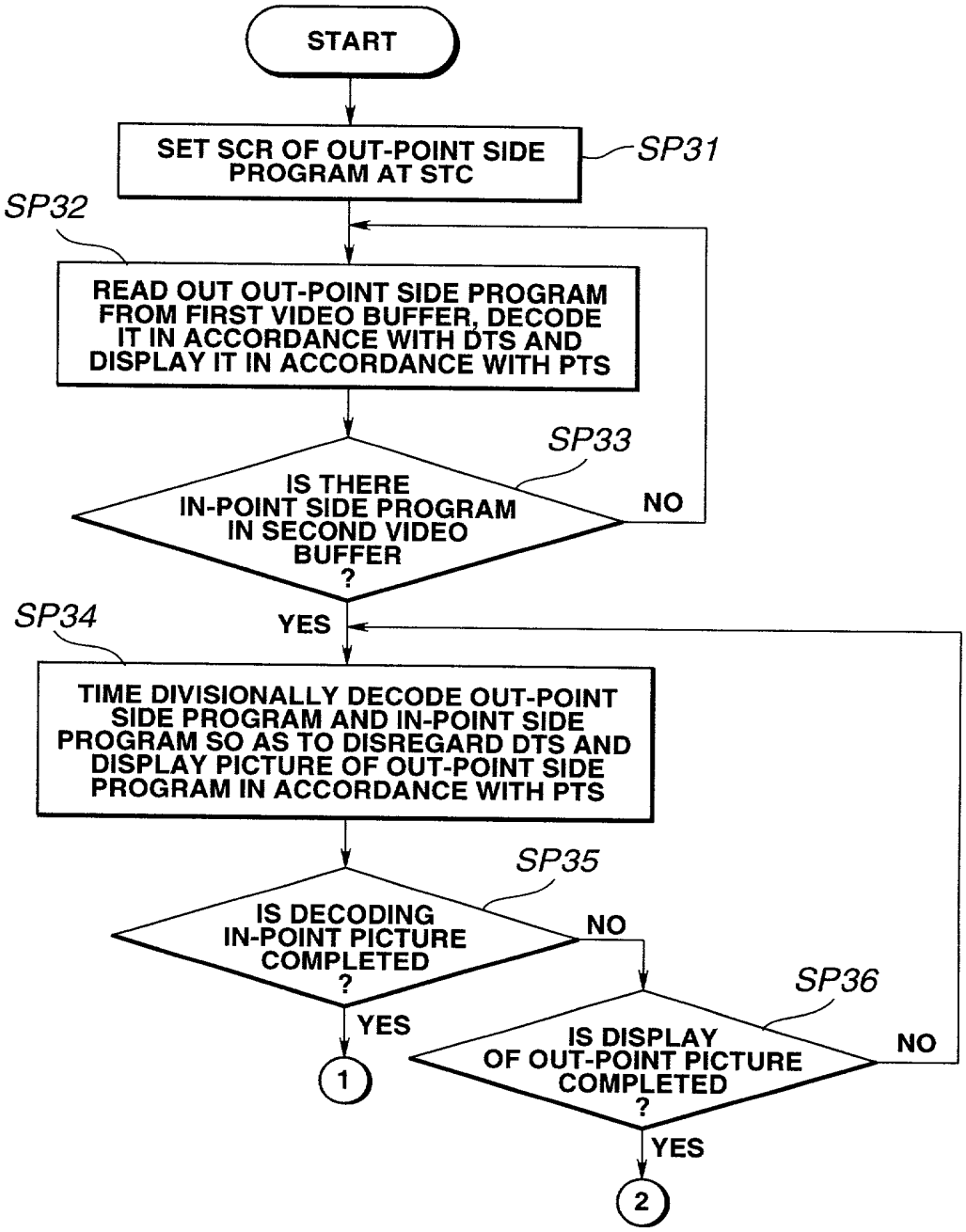

START
SET SCR OF OUT-POINT SIDE PROGRAM AT STC
SP31
SP32
READ OUT OUT-POINT SIDE PROGRAM FROM FIRST VIDEO BUFFER, DECODE IT IN ACCORDANCE WITH DTS AND DISPLAY IT IN ACCORDANCE WITH PTS
SP33
IS THERE IN-POINT SIDE PROGRAM IN SECOND VIDEO BUFFER ?
NO
YES
SP34
TIME DIVISIONALLY DECODE OUT-POINT SIDE PROGRAM AND IN-POINT SIDE PROGRAM SO AS TO DISREGARD DTS AND DISPLAY PICTURE OF OUT-POINT SIDE PROGRAM IN ACCORDANCE WITH PTS
SP35
IS DECODING IN-POINT PICTURE COMPLETED ?
NO
YES
SP36
IS DISPLAY OF OUT-POINT PICTURE COMPLETED ?
NO
YES
1
2

FIG.19

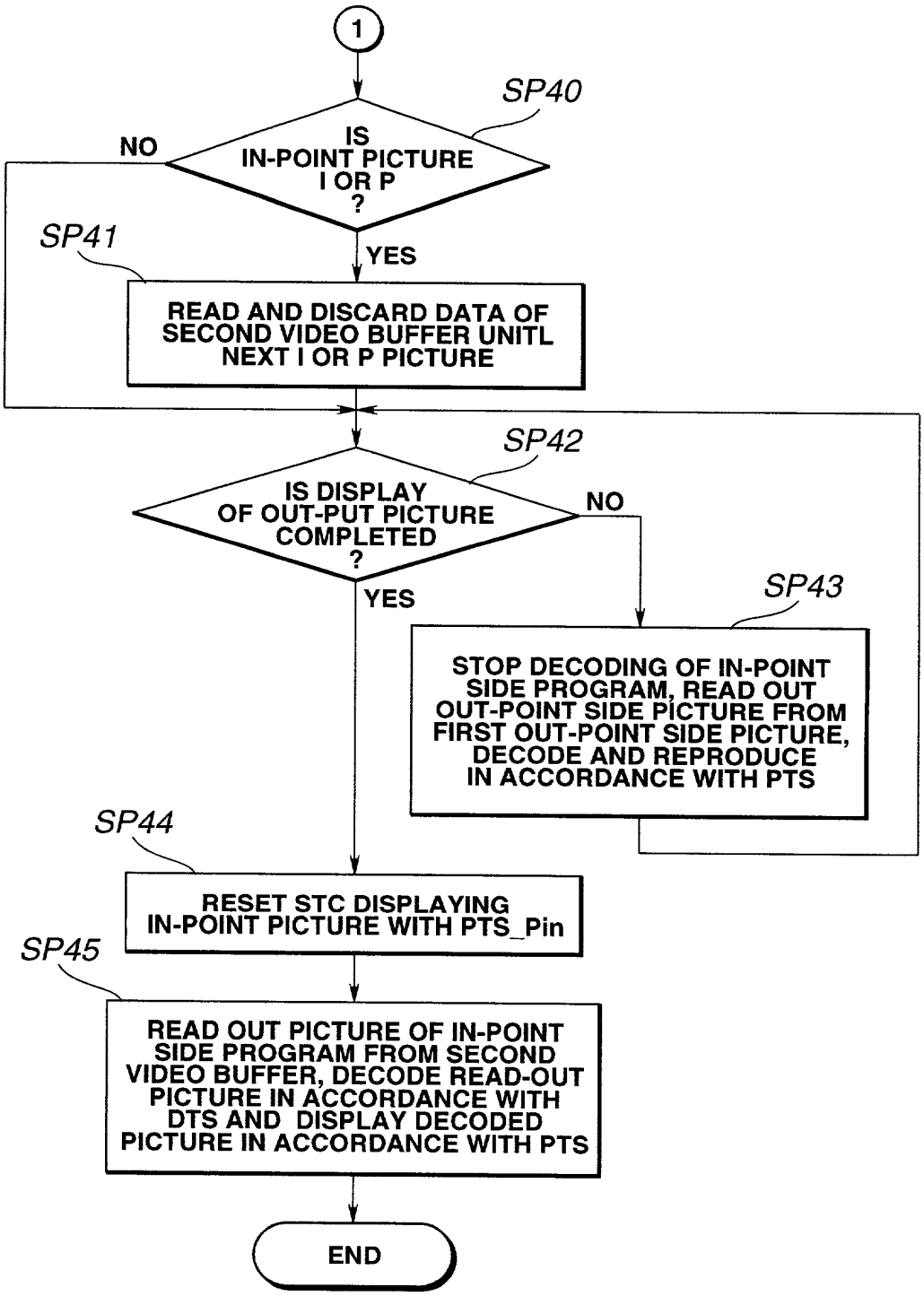

1
SP40
IS IN-POINT PICTURE I OR P ?
NO
YES
SP41
READ AND DISCARD DATA OF SECOND VIDEO BUFFER UNITL NEXT I OR P PICTURE
SP42
IS DISPLAY OF OUT-PUT PICTURE COMPLETED ?
NO
YES
SP43
STOP DECODING OF IN-POINT SIDE PROGRAM, READ OUT OUT-POINT SIDE PICTURE FROM FIRST OUT-POINT SIDE PICTURE, DECODE AND REPRODUCE IN ACCORDANCE WITH PTS
SP44
RESET STC DISPLAYING IN-POINT PICTURE WITH PTS_Pin
SP45
READ OUT PICTURE OF IN-POINT SIDE PROGRAM FROM SECOND VIDEO BUFFER, DECODE READ-OUT PICTURE IN ACCORDANCE WITH DTS AND DISPLAY DECODED PICTURE IN ACCORDANCE WITH PTS
END

FIG.20

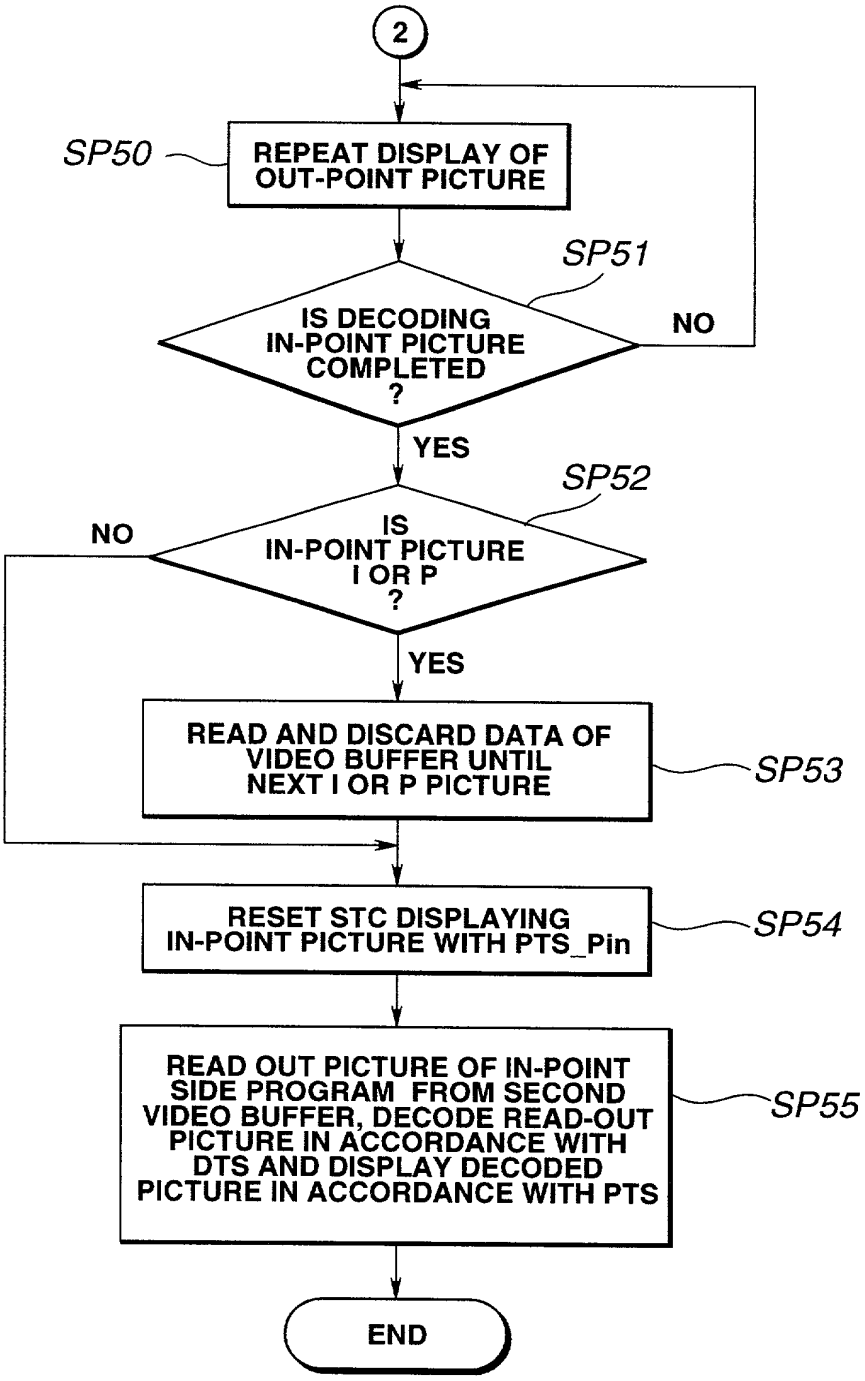

2
SP50
REPEAT DISPLAY OF OUT-POINT PICTURE
SP51
IS DECODING IN-POINT PICTURE COMPLETED ?
NO
YES
SP52
IS IN-POINT PICTURE I OR P ?
NO
YES
READ AND DISCARD DATA OF VIDEO BUFFER UNTIL NEXT I OR P PICTURE
SP53
RESET STC DISPLAYING IN-POINT PICTURE WITH PTS_Pin
SP54
READ OUT PICTURE OF IN-POINT SIDE PROGRAM FROM SECOND VIDEO BUFFER, DECODE READ-OUT PICTURE IN ACCORDANCE WITH DTS AND DISPLAY DECODED PICTURE IN ACCORDANCE WITH PTS
SP55
END

FIG.21

FIG.22A

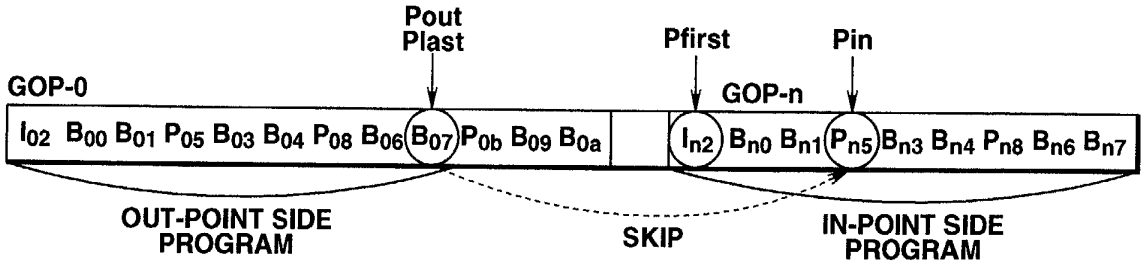


FIG.22B

FIG.22C

FIG.22D

FIG.22E

FIG.22F

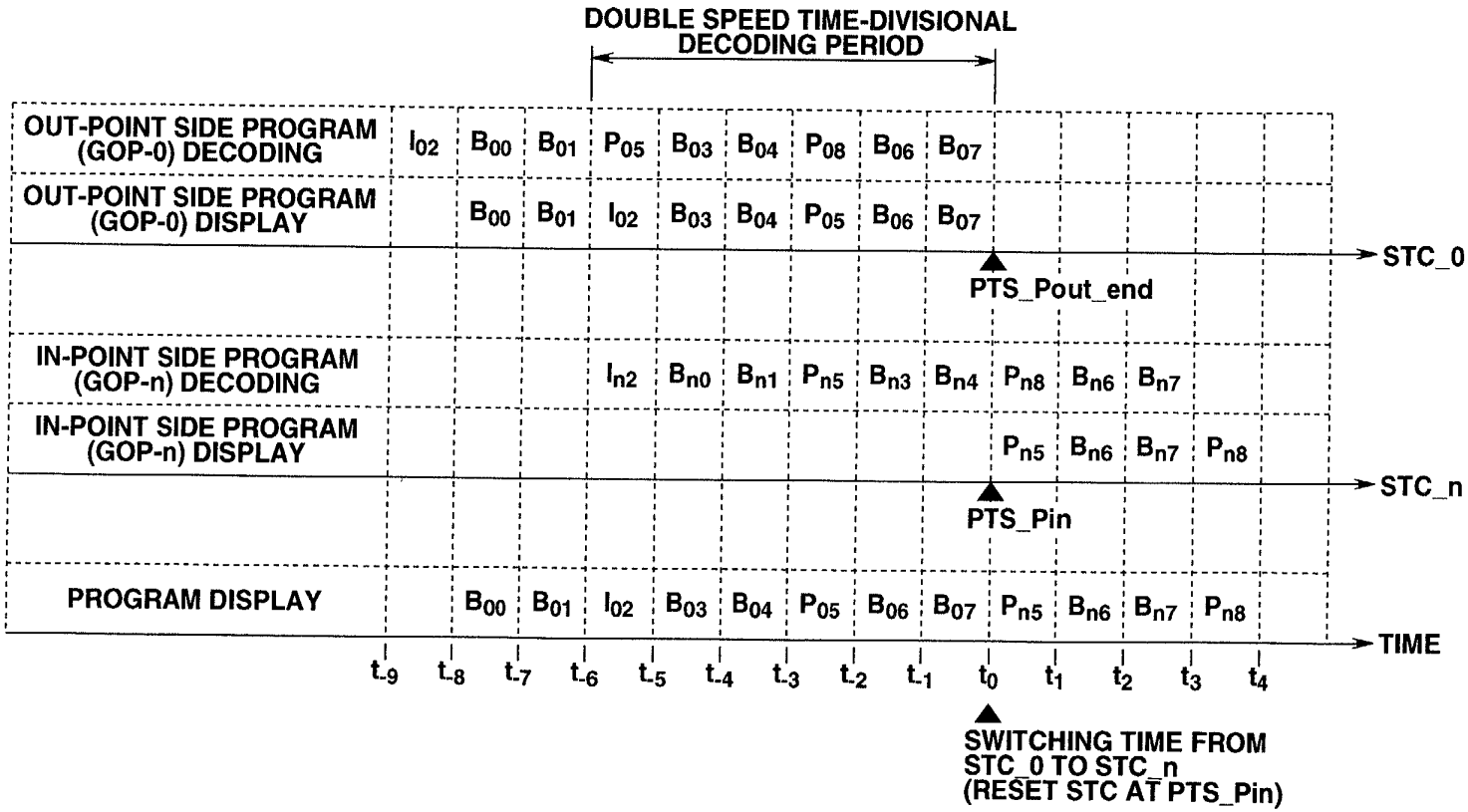
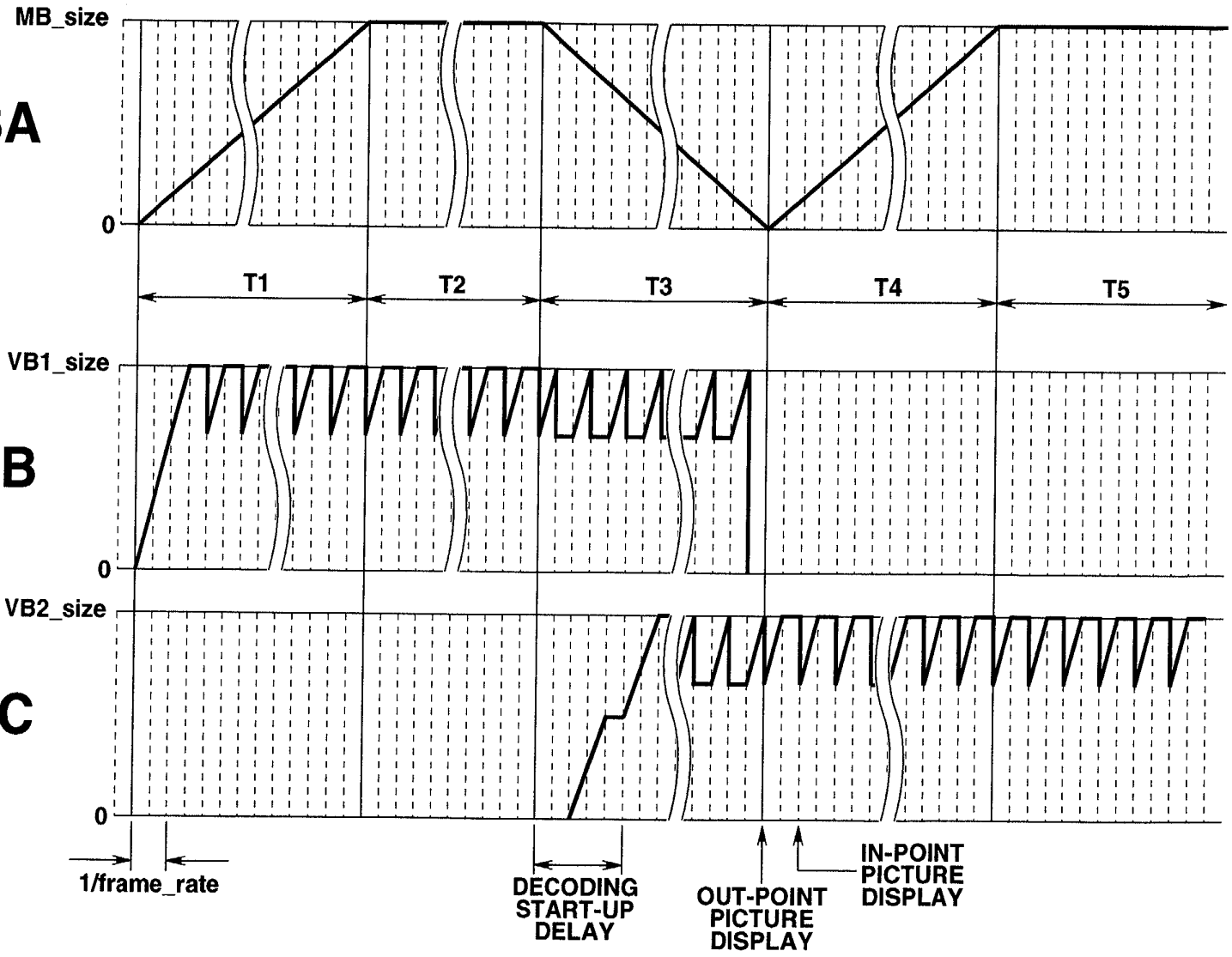


FIG.23A

FIG.23B

FIG.23C



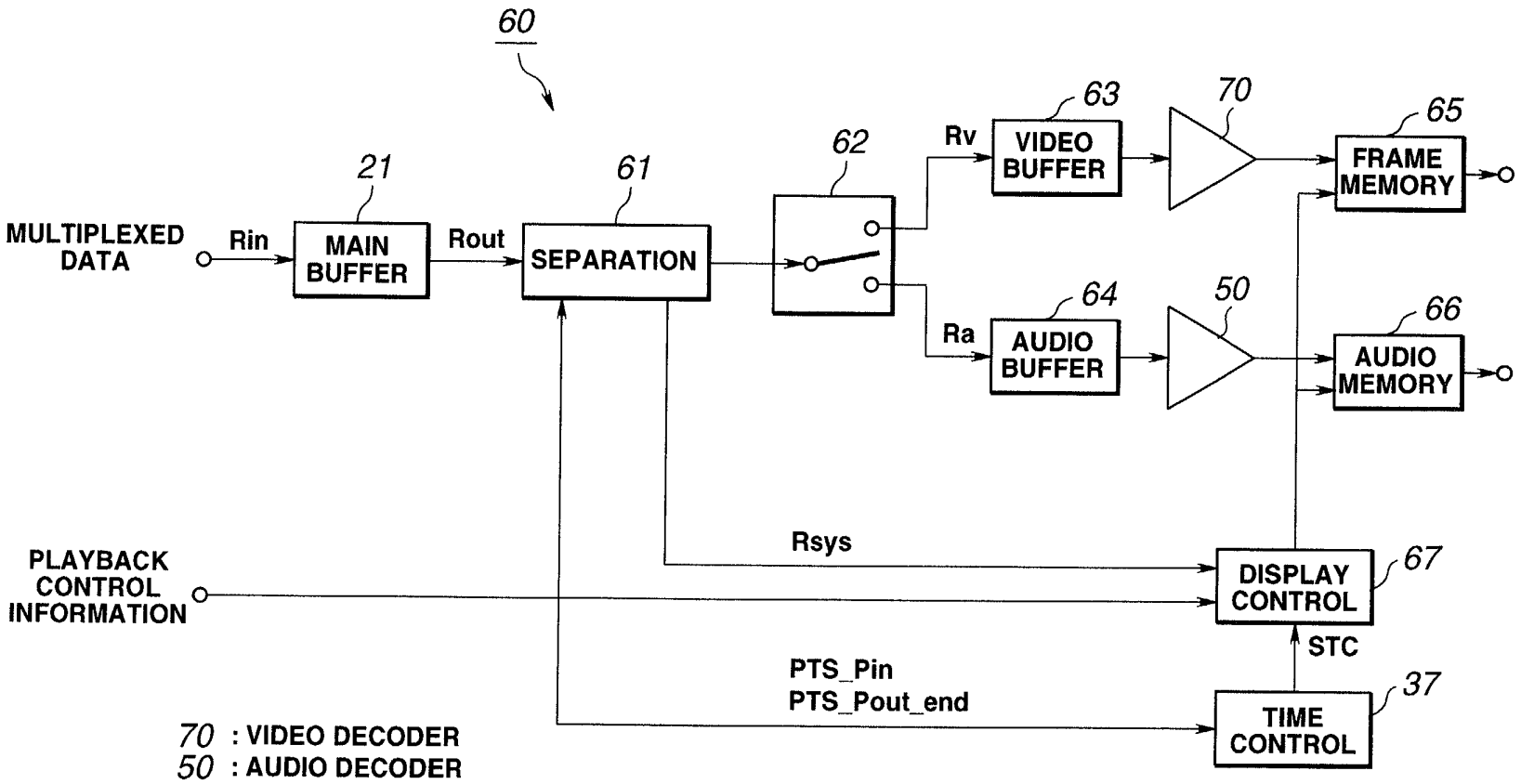

60
MULTIPLEXED DATA
Rin
21
MAIN BUFFER
Rout
61
SEPARATION
62
Rv
63
VIDEO BUFFER
70
65
FRAME MEMORY
Ra
64
AUDIO BUFFER
50
66
AUDIO MEMORY
PLAYBACK CONTROL INFORMATION
Rsys
DISPLAY CONTROL
67
STC
PTS_Pin
PTS_Pout_end
TIME CONTROL
37
70 : VIDEO DECODER
50 : AUDIO DECODER

FIG.24

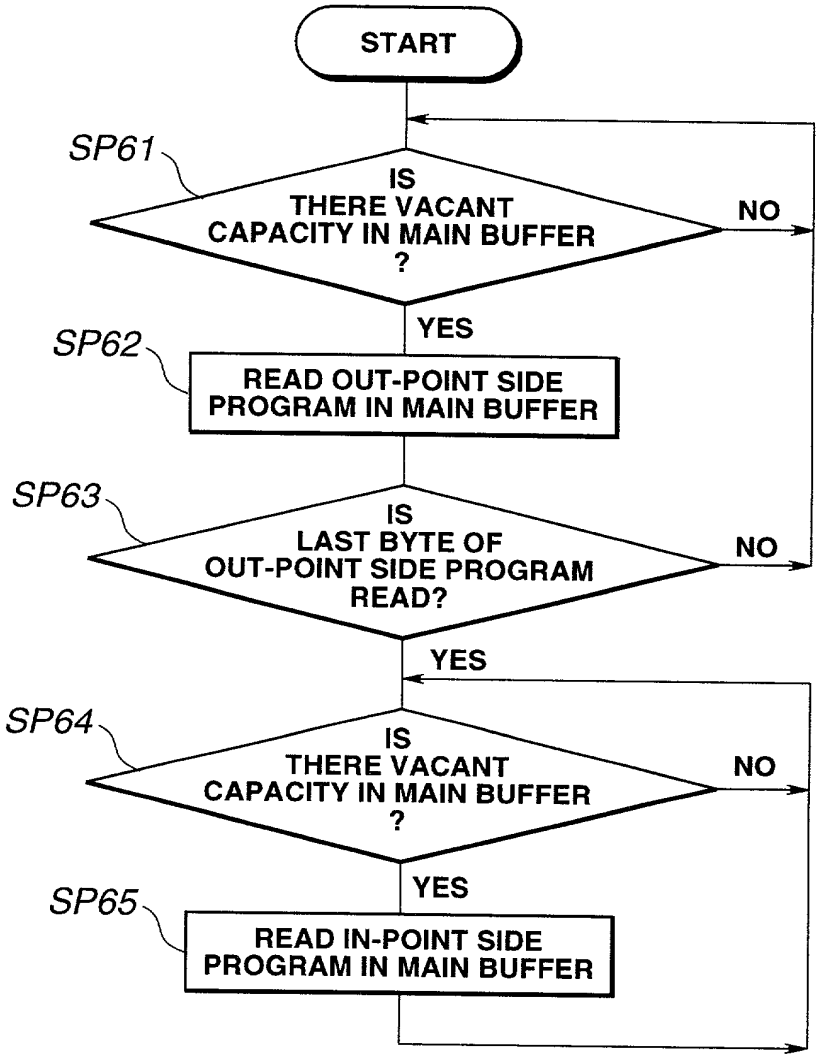

START
SP61
IS THERE VACANT CAPACITY IN MAIN BUFFER ?
NO
YES
SP62
READ OUT-POINT SIDE PROGRAM IN MAIN BUFFER
SP63
IS LAST BYTE OF OUT-POINT SIDE PROGRAM READ?
NO
YES
SP64
IS THERE VACANT CAPACITY IN MAIN BUFFER ?
NO
YES
SP65
READ IN-POINT SIDE PROGRAM IN MAIN BUFFER

FIG.25

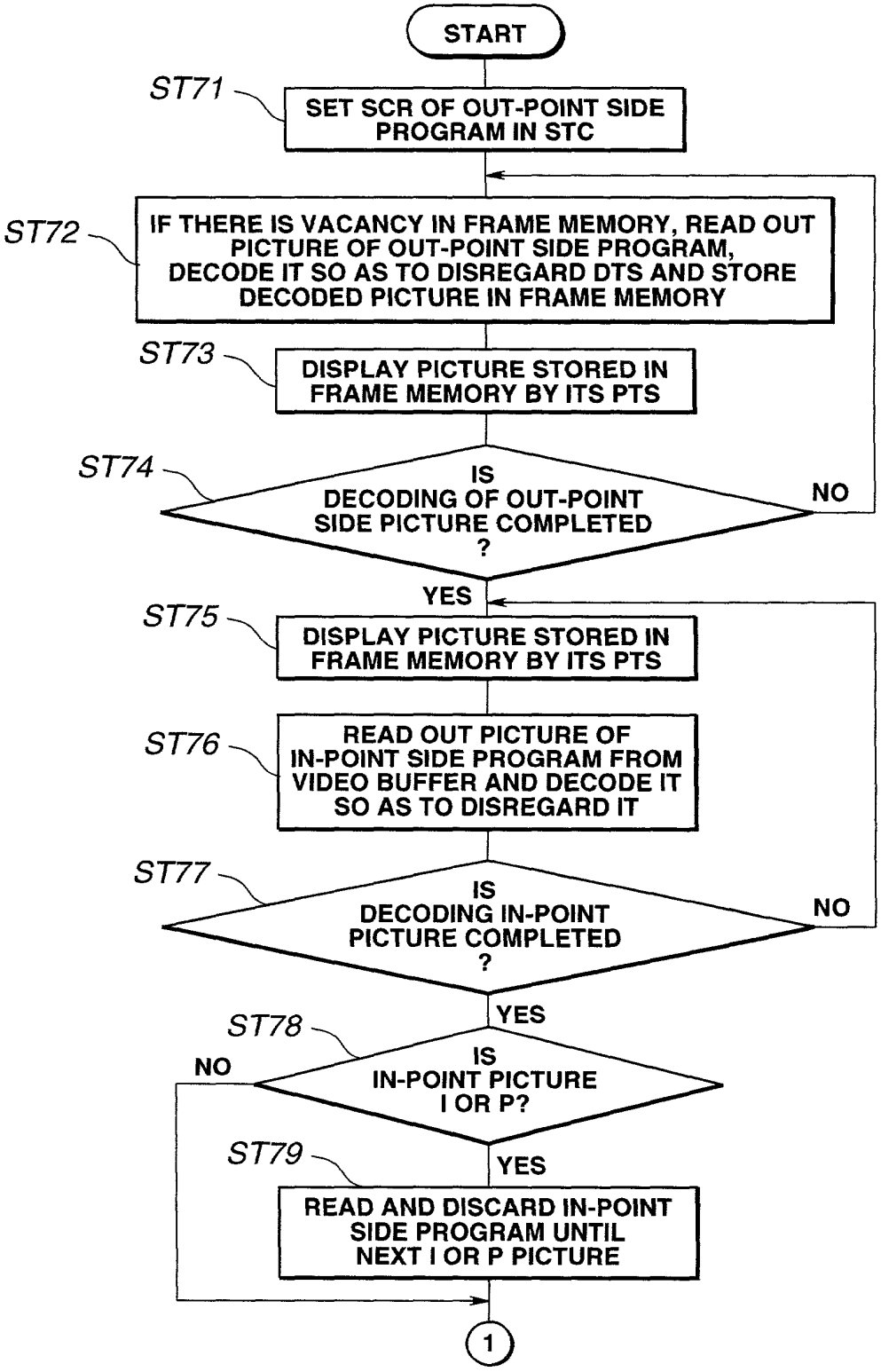

START
ST71
SET SCR OF OUT-POINT SIDE PROGRAM IN STC
ST72
IF THERE IS VACANCY IN FRAME MEMORY, READ OUT PICTURE OF OUT-POINT SIDE PROGRAM, DECODE IT SO AS TO DISREGARD DTS AND STORE DECODED PICTURE IN FRAME MEMORY
ST73
DISPLAY PICTURE STORED IN FRAME MEMORY BY ITS PTS
ST74
IS DECODING OF OUT-POINT SIDE PICTURE COMPLETED ?
NO
YES
ST75
DISPLAY PICTURE STORED IN FRAME MEMORY BY ITS PTS
ST76
READ OUT PICTURE OF IN-POINT SIDE PROGRAM FROM VIDEO BUFFER AND DECODE IT SO AS TO DISREGARD IT
ST77
IS DECODING IN-POINT PICTURE COMPLETED ?
NO
YES
ST78
IS IN-POINT PICTURE I OR P?
NO
YES
ST79
READ AND DISCARD IN-POINT SIDE PROGRAM UNTIL NEXT I OR P PICTURE
1

FIG.26

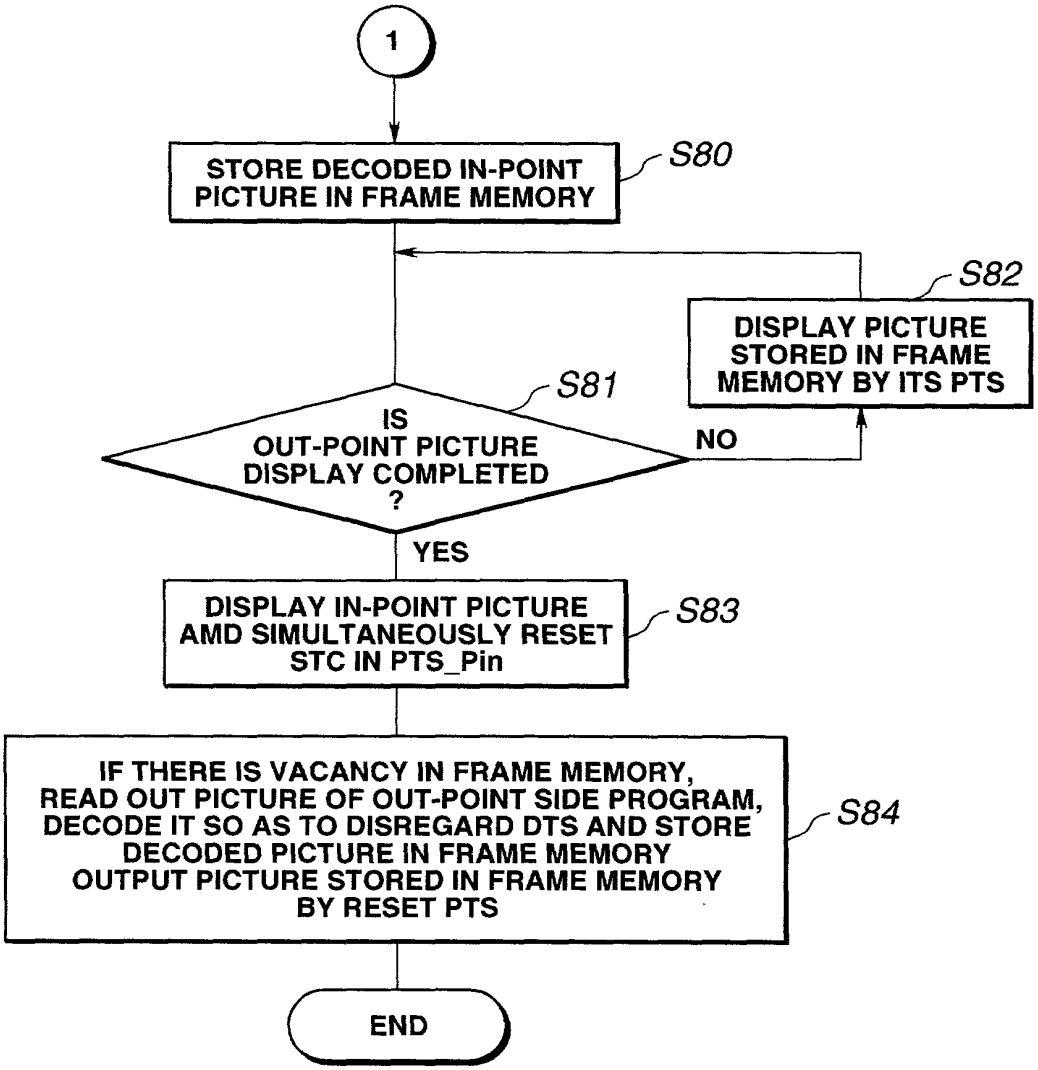

1
STORE DECODED IN-POINT PICTURE IN FRAME MEMORY
S80
S82
DISPLAY PICTURE STORED IN FRAME MEMORY BY ITS PTS
S81
IS OUT-POINT PICTURE DISPLAY COMPLETED ?
NO
YES
DISPLAY IN-POINT PICTURE AMD SIMULTANEOUSLY RESET STC IN PTS_Pin
S83
IF THERE IS VACANCY IN FRAME MEMORY, READ OUT PICTURE OF OUT-POINT SIDE PROGRAM, DECODE IT SO AS TO DISREGARD DTS AND STORE DECODED PICTURE IN FRAME MEMORY OUTPUT PICTURE STORED IN FRAME MEMORY BY RESET PTS
S84
END

FIG.27

FIG.28A

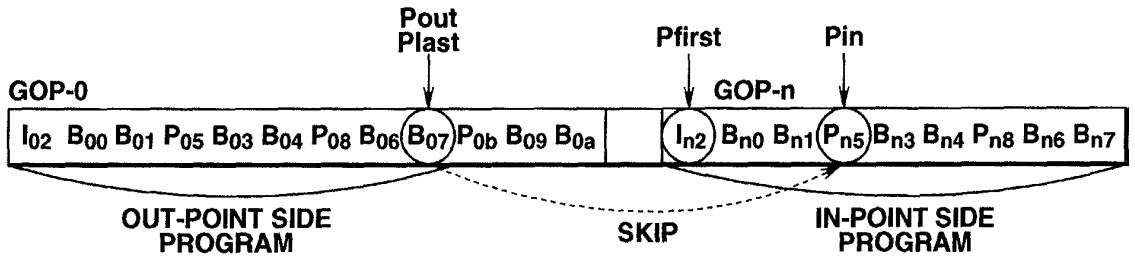


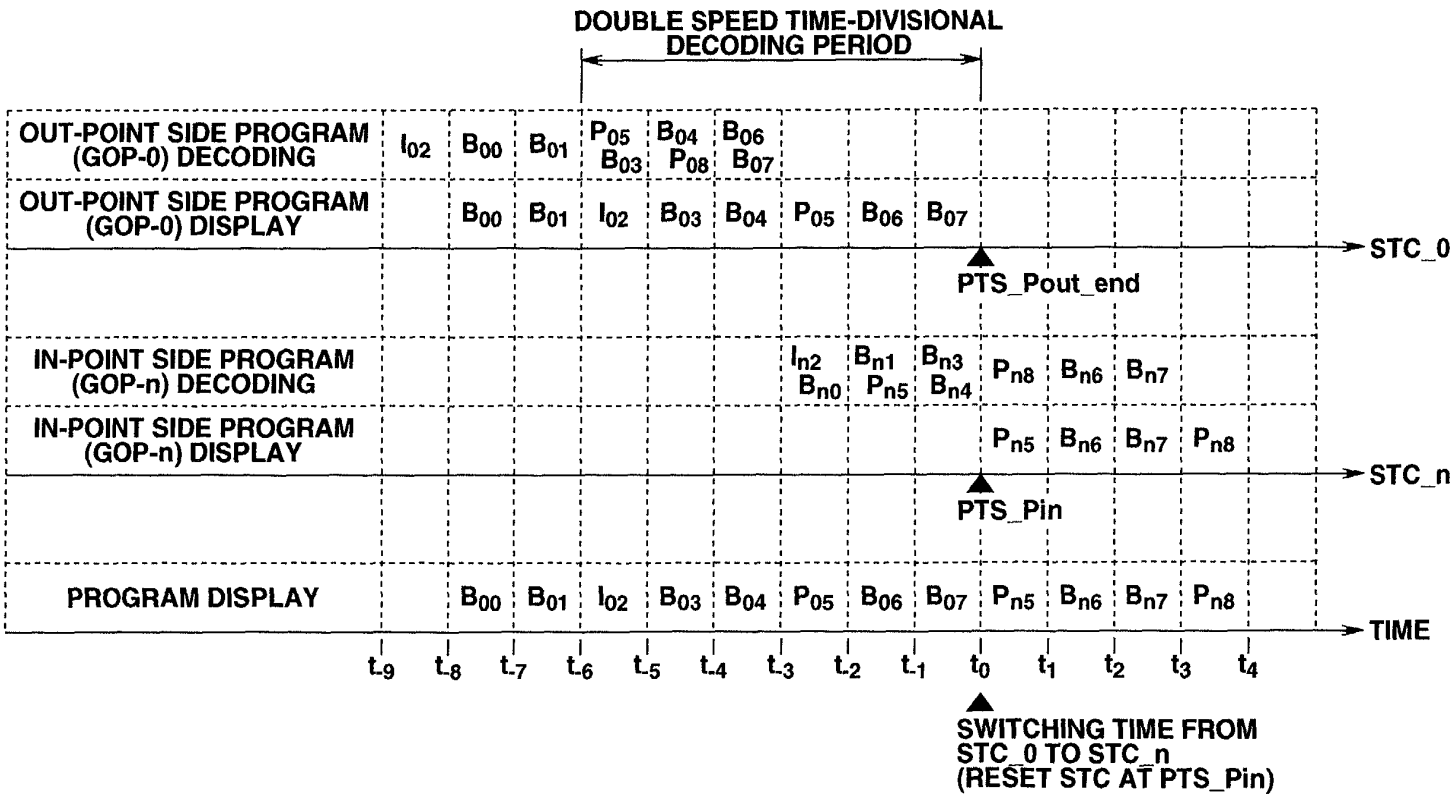
FIG.28B

FIG.28C

FIG.28D

FIG.28E

FIG.28F



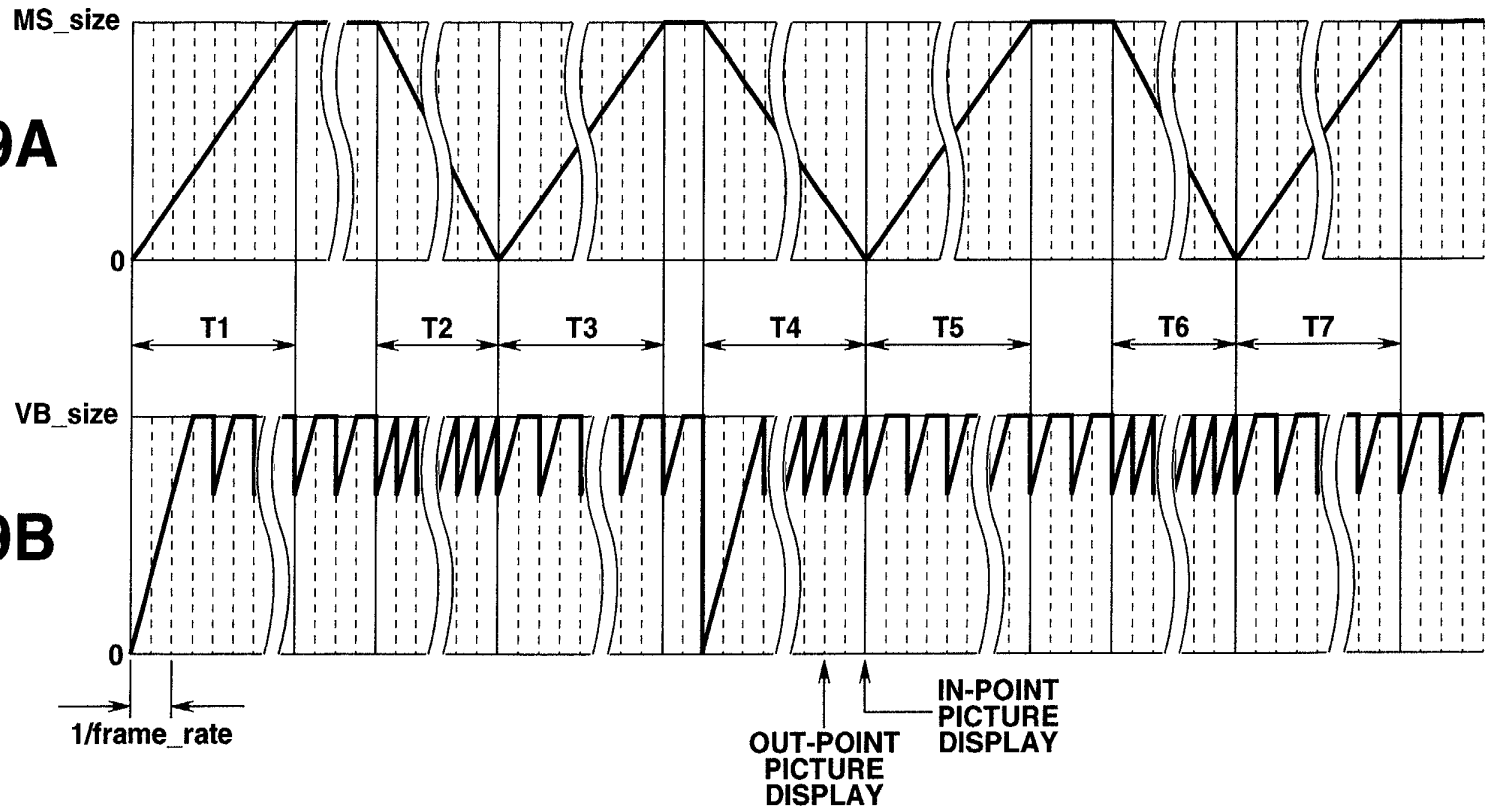

MS_size
0
T1
T2
T3
T4
T5
T6
T7
VB_size
0
1/frame_rate
OUT-POINT PICTURE DISPLAY
IN-POINT PICTURE DISPLAY

FIG.29B